



**Maldives Clean Environment Project**  
**Ministry of Environment**  
Republic of Maldives

**TERMS OF REFERENCE**

**Dismantle Incinerator in K. Thilafushi Transfer and Install it in Gn. Fuvahmulah**

**1. Introduction**

The Ministry of Environment (ME) is currently implementing a project to establish a solid waste management system in Gn. Fuvahmulah. In order to establish the system, the Ministry has included an incineration facility in its plan for Gn. Fuvahmulah. ME has decided to dismantle an incinerator in K. Thilafushi, transfer and install it in Gn. Fuvahmulah.

The 5 incinerators in K. Thilafushi are of Inciner 8-700 model with a capacity of 4 tons/d each. Since a larger waste management facility is being planned and designed for Thilafushi by ME, the installed facility mentioned above is expected to be redundant. However, these individual incinerators can be utilized in other islands with lower waste generation.

Therefore, ME seeks a contractor to dismantle an incinerator in Thilafushi, transfer and install it in Gn. Fuvahmulah. The contractor is expected to carry out the following works.

**2. Mechanical Works**

**A. Dismantling at K. Thilafushi.**

1. One incinerator from 5 of existing incinerator has to be dismantled and transport and re install at the new island and re commissioning has to be done as per the standard commissioning procedures.
2. Control cabling and power cabling has to be isolated including Programmable Logic Controller (PLC) communication cables of each panel board.
3. Ethernet cables from each remote monitoring system has to be program as per the PLC software before then de terminated.
4. Once the control /power/communication cables de terminated from the panel and the instruments, each sensors and instruments have to be dismantled.
5. Once the instruments and sensors dismantle from the incinerators, main incinerator and secondary combustion chamber and the venturi scrubber, chimney has to be dismantled.
6. PLC of the rest of the 4 incinerators has to be re programmed to run individually since the 5th incinerator is taken out.
7. Dismantling of burners, sensors, instruments has to be done only by an professional engineer who has experience in thermal engineering.

8. Re programming of existing 4 incinerators has to be done by authorised programmer as per the requirement by the supplier.

## **B. Logistics**

1. For the dismantling and handling has to be done only by a crane above 25ton capacity.
2. Handling of incinerator and chimney by using wheel loaders and excavators are not allowed.
3. Inland transportation has to be done only by trailer.
4. Detailed plan of logistical arrangements for dismantling, handling, transfer and installation, including the construction of incinerator shed **has to be submitted with the bids** (as per the bid clause 16) highlighting the following:
  - a. Equipment that will be used
  - b. Details of vehicles and vessels for land and sea transportation
  - c. List of staff and technical personnel involved in the dismantling, handling and transfer and installation
  - d. Methodology & work plan
  - e. Timeline
5. The incinerator shall be insured until delivered to the destination

## **C. Installation at Gn. Fuvahmulah**

1. Install main incinerator, secondary combustion chamber, chimney and the venturi by using a crane.
2. Installation of burners, sensors, instruments as per the electrical diagram.
3. Laying of new cabling as per the electrical diagram.
4. Re program whole operation as per the new data.
5. Re commissioning the machine with the PLC as per the commissioning procedures given by the supplier.
6. Re commission the remote monitoring system and connecting to the main server of the INCINER8 and update the software.
7. Once the PLC is programmed and update with new software, new operation password has to be made for different working levels, which should be only done by an authorised electrical engineer with a programmer.
8. Complete new diesel and water piping circuit has to be done at the new site based on the new layout.

## **D. Expertise and Knowledge**

1. The engineer who is handling the whole work has to be qualified in the field of thermal engineering with the knowledge of incinerators, electronics, automation and PLC programming,
2. Should be able to work with the OMRON and SIEMENS PLC with remote monitoring applications.

3. Engineer should be sound with the knowledge of diesel burner tuning and programming for better emission standards.
4. To carry out the whole commissioning process there should be an electrical engineer and PLC programmer who already have knowledge about the incinerator process and the burners.

### 3 Civil Works and Shed works

Incinerator will be placed in a rain and water proofed shed. **The shed will be constructed by the contractor and the detailed design and drawing to be provided by the contractor to Ministry of Environment for approval.**

Regarding the civil works the required space is minimum 40 feet x 40 feet incinerator building and maximum as shown in the attached concept drawing. The building needs a special high span truss with steel beams and there should not be any column between the span of the building. This requirement is set to allow for wheel loader access to inside the building (shed) for loading waste into the incinerator. **The design and load calculation report of the steel structure should be submitted to Ministry of Environment for approval.** Final approved drawing ministry should be stamped by a Structural Engineer registered in Maldives. Therefore, the price for civil works should include.

1. Concrete plinth works
2. Floor concrete
3. Steel shed with roof
4. Side cladding for 3 sides
5. Louvers or mechanical exhausts for ventilation
6. Brick boundary wall
7. Required down pipes and gutters
8. Materials, consumables, labour,
9. Required roofing lights and power outlet sockets.

#### **Bid Price**

Bid price shall include both for mechanical and civil works. For the mechanical works CVs and educational certificates of technical experts mentioned in 2D (Expertise and knowledge) should be given in the bid proposal.



## INCINERATOR TECHNICAL SPECIFICATION LIST

No.	Description	Measurements
<b>01</b>	<b>Combustion Chamber</b>	
A	A.1.1. Combustion chamber volume	Not less than 10m <sup>3</sup>
A	A.1.2. Parallelepiped shape	
A	A.1.3. Inner surface	Inner surface carried out with first-rate refractory material , high-temperature proof
A	A.1.3 Loading Door	1 nos loading door set on the top of the burning chamber, suitable to load the waste material
A	A.1.4 De-ashing door.	
A	A.1.5. Opening of door	Opening of the door assisted by counterweight system
A	A.1.6. Burner Capacity	500 kg/h
A	A.1.6. Loading Capacity	not less than 1,000 kg/cycle
A	A.1.7 Batch time	< 6 hours
A	A.1.8 Operating temperature	900-1000°C; (up to 1200°C)
<b>02</b>	<b>Post-Combustion Chamber</b>	
	Post-combustion chamber with controlled combustion, structures so that the gas generated due to the incineration process will be kept even in the worst condition, to a temperature as follows	
A	A.2.1. Design	vertical parallelepiped shape
A	A.2.2. Inner covering	carried out with first-rate refractory material, high temperature proof
A	A.2.3. Door	1 nos small inspection door
B	B.2.4 Free oxygen content	> 6%
B	B.2.5. Rate gas	> 10m/s.
B	B.2.6. Gas contact time	> 2 Sec
A	A.2.7. Working Temperature	>850 °C/1100°C
<b>03</b>	<b>Combustion System</b>	
	<p>Description: The incinerator must be provided with supply burners which turn on automatically when the temperature of the gas combustion, after the last air combustion injection, falls under the target temperature of 850 °C or 1100 °C. The burners are used as well during the start and stop system operations, this is to guarantee a regular temperature of 850 °C or 1100°C during these operations and as long as the waste material remains in the combustion chamber.</p> <p>All burners must have a non-stop ventilation system, to avoid damages to stoke wholes, openings), and to the deflector group, caused by high working temperatures they are exposed, when reached the fixed limit they go on stand-by. Burners are also provided with instruments for the pyrometric temperature check,</p>	

	to keep automatically the incineration oven and the post-combustion chamber to the fixed planned temperatures.	
	Combustion plant must be composed of:	
A	A.3.1. Diesel automatic burners	(preferably CE marked), to be installed on duty of the incineration chamber.
A	A.3.2. Diesel supply burners	(preferably CE marked), to be installed on duty of the post combustion chamber.
A	A.3.3. Fuel consumption:	Should not exceed 35 L/h (Diesel)
A	A.3.4. Refractory line	Caldegun or similar
A	A.3.5. Fuel Tank	Fuel tank installed with the incineration system which caters the fuel requirements of the system.
04	Chimney Next to fumes exit will be placed a chimney having the following features:	
A	A.4.1. Material	Manufactured in stainless steel AISI 304.
A	A.4.2. Design	Cylindrical shape
B	B.4.3. Design	Fumes exit is 5 meters far above the ground
05	Electrical Switchboard The incineration system must have an electric switchboard for the control of all the electric equipments and preferably CE certified	
A	A.5.1. Standard	3Phase + neutral + earth cable
A	A.5.2. General Switch	1 nos
A	A.5.3. Independent systems of thermoregulation (with LCD displays) in order to keep the incineration chamber and the post-combustion chamber at a planned regular temperature	2 nos
A	A.5.4. Thermocouples type K in stainless steel	2 nos
A	A.5.5. Electro cycle timer	1 nos
A	A.5.6. Security system with limit switch to inhibit burner's flame when the door is open	1 nos
A	A.5.7. Incineration burner's motor over heating protection	1 nos
A	A.5.8. Incineration burner's motor over heating alarm	1 nos
A	A.5.9. Post combustion burner's motor over heating protection	1 nos

A	A.5.10. Post combustion burner's motor over heating alarm	1 nos
A	A.5.11. Incineration burner block alarm	1 nos
A	A.5.12. Post-combustion chamber burner block alarm	1 nos
A	A.5.13. Incineration burner switch	1 nos
A	A.5.14. Post-combustion chamber burner switch	1 nos
A	A.5.15. Cycle start switch	1 nos
06	<p><b>Wet Scrubbers</b></p> <p>One for each incinerator. Particles removal system is a humid working installation, composed by a Scrubber connected through a pipe, fully covered with refractory material on the gas exit coming out from post-combustion chamber.</p> <p>The system shall provide the following:</p>	
A	A.6.1. Operation	The system must turn on when the incineration oven comes into action and turns off once the planned cycle is complete.
A	A.6.2. Particles removal system	The wet scrubber must be a closed-loop system so it does not need to change the water and therefore able to self-recycling of water.
A	A.6.3. Alarm system	An acoustic and visual alarm that provides signal the damage in case of an accidental malfunctioning of the Scrubber.
07	<b>Technical Conditions</b>	
A	A.7.1. Standards	The design of the incinerator has to be in accordance with an internationally acceptable standards, such as CE or similar.